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(71)Applicant : SHOWA ALUM CORP

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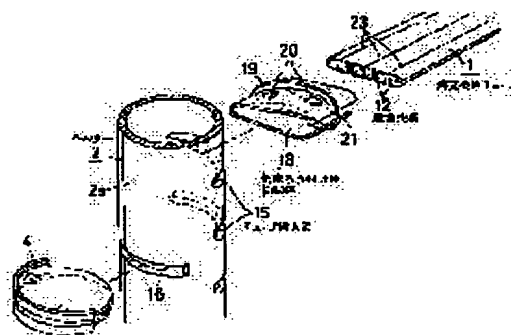
(72)Inventor : ITO SHINJI

## (54) HEAT EXCHANGER

## (57)Abstract:

PURPOSE: To surely join a tube 1 and a header 2 by brazing to a hermetic state.

CONSTITUTION: A cylindrical body 18 for hermetic brazing is inserted and disposed in a fit state into a tube insertion hole 15 of the header 2. The end of the tube 1 for heat exchange projected with curved projecting lines 12 within the tube is inserted and disposed into the cylindrical body 18 for hermetic brazing in the state of fitting to the outer periphery. The head 2 and the cylindrical body 18 for hermetic brazing as well as the cylindrical body 18 for hermetic brazing and the tube 1 are joined and integrated by brazing.



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**CLAIMS**

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[Claim(s)]

[Claim 1] In the heat exchanger which has the crookedness protruding line to which the tube for heat exchange extends in the die-length direction projected in tubing by being crooked in the shape of a clinch in a part of hoop direction of a tube tube wall and by which the edge of this tube was connected to the hollow header at the free passage condition While changing the insertion arrangement of the tube-like object for airtight soldering of predetermined die length into an adaptation condition at the tube insertion hole of a header The heat exchanger characterized by changing the insertion arrangement of the edge of said tube into an adaptation condition into this tube-like object for airtight soldering, and soldering coming to carry out the junction unification of a header, the tube-like object for airtight soldering and the tube-like object for airtight soldering, and the tube.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Industrial Application]** This invention relates to metal heat exchangers, such as aluminum used for for example, the condenser for car air conditioners, the condenser for room air conditioners, etc.

**[0002]**

**[Description of the Prior Art]** For example, as a condenser for car air conditioners, the heat exchanger called the so-called multi-flow type or a parallel flow type is in the inclination used by preference recently as what can realize high temperature efficiency, low voltage force loss, and super-miniaturization.

**[0003]** As this heat exchanger is shown in Fig. 7, while the hollow header (2) of the Uichi Hidari pair [ both ends ] of two or more flat tube (1) — arranged at the juxtaposition condition and (2) are connected to a free passage condition Tube (1) — Do as that with which the fin (3) has been arranged in the gap of a between, and the inside of a header (2) was divided with the batch (4) in the position of the height direction. The refrigerant which flowed in the header (2) from the inlet pipe (5) circulates a tube group in the shape of meandering, and is flowing out of the outlet pipe (6).

**[0004]** By the way, especially by the flat tube in such a condenser, it shall have sufficient pressure resistance from the refrigerant which circulates the interior being a high pressure gas refrigerant.

**[0005]** The tube (1) as shown in Fig. 6 is recently proposed in order to reply to such a request. This tube (1) is what was manufactured by the aluminum brazing sheet by performing bending. When a part of up-and-down tube wall (8) and (9) were crooked a \*\* by return, the crookedness protruding line (12) of the letter of the protrusion in tubing prolonged in the die-length direction was formed, and junction unification was carried out by soldering the flat-surface tube wall (9) with which the tip of this crookedness protruding line (12) counters, and (8).

**[0006]** According to the tube (1) of this structure, when an up-and-down tube wall (8) and (9) are connected by the crookedness protruding line (12), it excels in pressure resistance. Moreover, by being what is manufactured by bending shaping of a web material, compared with cases, such as extrusion, tube height (H) can be made low, and the heat exchange engine performance can be improved. Furthermore, a predominance in fields, such as productivity, can be demonstrated by being really mold goods again.

**[0007]**

**[Problem(s) to be Solved by the Invention]** However, as the tube of the above-mentioned structure is adopted upwards and it is shown in Fig. 8 on manufacture of a heat exchanger in connection with a header (2) and (2), the conventional technique is followed with tube (1) — Tube insertion hole of the shape of a hoop direction slit prepared in the header (2) (15) — Insertion arrangement of tube (1) — is carried out inside. When soldering in the condition, the rill (23) produced in the peripheral face of a tube (1) by having formed the crookedness protruding line (12) by the cause The danger of producing a clearance between a tube (1) and a header (2), and not changing the soldering junction of this clearance into an airtight condition with good both

owing to where insertion arrangement of the edge of a tube (1) is carried out into the tube insertion hole (15) of a header (2) was high.

[0008] The above conventional faults are canceled and this invention aims at offering the heat exchanger of the structure which can change the soldering junction unification of this tube and the header into an airtight condition certainly in the heat exchanger as which the thing of structure which has the crookedness protruding line prolonged in the die-length direction projected in tubing by being crooked in the shape of a clinch in a part of hoop direction of that tube wall was adopted as a tube.

[0009]

[Means for Solving the Problem] In the above-mentioned purpose, this invention has the crookedness protruding line prolonged in the die-length direction projected in tubing when the tube for heat exchange was crooked in the shape of a clinch in a part of hoop direction of a tube tube wall. In the heat exchanger by which the edge of this tube was connected to the hollow header at the free passage condition, while changing the insertion arrangement of the tube-like object for airtight soldering of predetermined die length into an adaptation condition at the tube insertion hole of a header Let the heat exchanger characterized by changing the insertion arrangement of the edge of said tube into an adaptation condition into this tube-like object for airtight soldering, and soldering coming to carry out the junction unification of a header, the tube-like object for airtight soldering and the tube-like object for airtight soldering, and the tube be a summary.

[0010]

[Function] With the above-mentioned configuration, since the tube-like object for airtight soldering is what does not have a rill like [ in the case of a tube ] etc. in the peripheral face, airtight junction of the tubed tube-like object for airtight soldering and a tubed header is carried out by soldering at fitness. moreover, the thing which the clearance which the tube edge and the tube-like object for airtight soldering originated in the rill of a tube peripheral face, and produced them among both since the adaptation condition was equipped with the tube-like object for airtight soldering over a certain amount of die-length range at the tube edge solders — the die-length direction — in one of parts, it is blocked in wax material at least, and this changes soldering junction into an airtight condition. Its result, and the above tubes and headers of a configuration are certainly joined by the airtight condition by soldering.

[0011]

[Example] Next, the example which applied this invention to the condenser for air-conditioners is explained. In addition, it cannot be overemphasized that it is that in which the heat exchanger of this invention is widely applied to other various heat exchangers, and it deals.

[0012] The heat exchangers in this example are these tubes (1) while two or more flat tube for heat exchange (1) — is arranged at a level juxtaposition condition, as shown in Fig. 7. — The tubed hollow header (2) of a Uichi Hidari pair and (2) are connected to a free passage condition to both ends, and it is a tube (1). — It has the basic structure where fin (3) — has been arranged in the gap of a between. And the refrigerant which flowed from the inlet pipe (5) is a tube (1) further by dividing the inside of a header (2) and (2) with the batch member for meandering (4). — A group is circulated in the shape of meandering, and it is flowing out of the outlet pipe (6).

[0013] In this heat exchanger, as a tube (1) is shown in Fig. 6 The flat-surface tube wall (8) of the upper and lower sides which set predetermined spacing and have been arranged in parallel, and (9) were connected [ one ] by the U character-like wall (10) in metal texture in the 1 side-edge section, and the side edge section of another side curved to the method of inside, respectively, and compared, and it changed into the condition. And crookedness protruding line (12) — prolonged in the die-length direction projected in tubing when a part of that tube wall was crooked in the shape of a clinch was formed in an up-and-down flat-surface tube wall (8) and (9), and it was contacted at the inside of the flat-surface tube wall (9) with which a point counters, and (8) of this crookedness protruding line (12) —. Using the strip-like aluminum brazing sheet with which the clad of the wax material layer was carried out to both sides, this tube (1) performs bending by roll-forming processing etc. to this, and is really fabricated.

[0014] A header (2) and (2) consist of a header cap (2b) which plugged up the header pipe (2a) and its vertical edge opening of the shape of a pipe, and the shape of a cylinder which were made in the outside attachment condition by curving the aluminum brazing sheet of one sheet with which the clad of the wax material layer was carried out to external surface or both sides in the edges-on-both-sides section comparison condition, and (2b).

[0015] As shown in the pipe (2a) of this header (2) and (2) in Fig. 2 etc., hoop direction slit-like hole [ tube insertion ] (15) — is installed successively by the near peripheral wall of that side edge comparison section and the contrary. in addition — a header pipe (2a) — in addition, the voice over the side edge comparison section — it sets like and the diaphragm insertion hole (16) etc. is prepared. In addition, the batch member (4) is manufactured using the aluminum brazing sheet.

[0016] And in order to change the soldering junction of a header (2), (2), and tube (1) — into an airtight condition, the tube-like object for airtight soldering (18) as shown in Figs. 1 and 2 is used. This tube-like object for airtight soldering (18) is the flat tubed member of the predetermined die length corresponding to the periphery configuration of a flat tube (1). And radii-like the projected part for positioning (19) in alignment with the peripheral face configuration of a header (2) is prepared in that die-length direction pars intermedia, one side is projected in a header (2) bordering on this projected part for positioning (19), and the another side side projects besides a header (2). Moreover, the projected part for \*\*\*\*\* (20) which engages with the inner skin of a header (2) to the both sides of the upper wall section and the low wall section with the flat part projected and arranged in a header (2) is formed in this tube-like object for airtight soldering (18). Furthermore, the infeed (21) which attains to that overall length is formed, it is held in a components independent condition at the condition that this infeed (21) was opened a little, and the springback function is given to the 1 side edge section of this tube-like object for airtight soldering (18). In addition, it is closed by this infeed (21) where insertion arrangement of this tube-like object for airtight soldering (18) is carried out at the tube insertion hole (15) of a header (2). In addition, although this tube-like object for airtight soldering (18) was manufactured in the aluminum material to which the clad of the wax material is not carried out since a tube (1) and a header (2) were the products made from a brazing sheet, it could be manufactured using wax material clad plates, such as an aluminum brazing sheet with which the clad of the wax material layer was carried out, if needed to both sides.

[0017] in addition, a fin (3) — the width of face of a tube (1), and abbreviation — it is based on the corrugated fin which fabricates the web material of the same width of face in the shape of corrugated one, and started the louver, and the aluminum brazing sheet with which the clad of the wax material layer was carried out to at least one side or both sides is used as this web material.

[0018] In manufacture of a heat exchanger, each heat exchanger configuration member is first assembled in the trial fitting condition mutually.

[0019] That is, the projected part for positioning (19) inserts the tube-like object for airtight soldering (18) in each tube insertion hole [ of a header (2) and (2) ] (15) — first to the location which contacts the peripheral face of a header (2). This tube-like object for airtight soldering (18) is held in the insertion arrangement condition to a tube insertion hole (15) at a proper positioning condition by forming infeed (21) in that 1 side-edge section, and giving the springback function. And when the projected part for \*\*\*\*\* (20) and (20) engage with the inner skin of a header (2), a more positive \*\*\*\*\* operation is done so.

[0020] And by [ of two or more tube (1) — arranged in the juxtaposition condition ] inserting a header (2) and (2) in both ends, and inserting the edge of a tube (1) in a tube insertion hole (15), it inserts in and assembles to the so-called heat exchanger skeleton which becomes tube (1) — from a header (2) and (2). It is in the condition that an edge is large to the tube-like object for airtight soldering (18), and tube (1) — was covered, in this condition.

[0021] And it is further assembled by the heat exchanger assembly to this heat exchanger skeleton by attaching a corrugated fin (3), a batch member (4), an inlet pipe (5), an outlet pipe (6), etc.

[0022] Subsequently, the junction unification of the whole is carried out including the side edge

comparison section of a header (2) and (2), the side edge comparison section of a tube (1), the point of a crookedness protruding line (12), the contact section of a correspondence flat-surface tube wall (9) and (8), etc. by putting in this heat exchanger assembly all over a furnace, and performing flux soldering or vacuum soldering. It is manufactured by the heat exchanger by the above.

[0023] During this soldering, since the header (2) and the tube-like object for airtight soldering (18) are formed in the field without irregularity, such as a rill to which the peripheral face of the tube-like object for airtight soldering (18) was based on the configuration of a tube insertion hole (15), it changes the junction unification of the wax material among both into a stylish rear spring supporter and an airtight condition proper. In addition, a more positive airtight junction condition is acquired according to the plane-of-composition product increase operation by the projected part for positioning (19) etc. Moreover, since the tube-like object for airtight soldering (18) has covered the edge of a tube (1) over a certain amount of large die-length range, wax material flows also into the clearance resulting from the rill (23) of a tube (1) peripheral face in a part of the die-length direction [ at least ], therefore the clearance is blocked, and the tube-like object for airtight soldering (18) and a tube (1) are joined by the airtight condition. Consequently, free passage connection of a header (2) and (2) is certainly changed into an airtight condition by operation of such a tube-like object for airtight soldering (18) with tube (1) —.

[0024] The tube-like object for airtight soldering of the example shown in Fig. 3 (18) is short length from the case of the above-mentioned example. After the projected part for positioning (19) contacted by the header (2) peripheral face was made with what was prepared in the edge of a cylinder part and has inserted in the tube insertion hole (15) of a header (2) This tube-like object for airtight soldering (18) projects in a header (2), and does not project besides the header (2). even if such a configuration is also inferior to the case of the above-mentioned example in the tube-like object for airtight soldering (18), and a tube (1) a little in certainty — abbreviation — soldering junction can be certainly changed into an airtight condition.

[0025] In addition, in each above-mentioned example, although made with that by which the projection for \*\*\*\*\* (20) which engages with the inner skin of a header (2) was prepared in the tube-like object for airtight soldering (18), you may make with the configuration of having omitted this projection for \*\*\*\*\* (20) like the example shown in Fig. 4 or Fig. 5.

[0026] Moreover, although the tube (1) of the structure by which soldering junction was carried out is adopted as the flat-surface wall (9) which the point of a crookedness protruding line (12) counters, and (8) as a tube in the above-mentioned example That what is necessary is just the tube for heat exchange with which not the thing limited to this but the crookedness protruding line to which a part of hoop direction of a tube wall is crooked in the shape of a clinch, and it extends in the die-length direction in tubing in short projected, and was formed this invention structure can be suitably applied also to the heat exchanger for which the tube of the structure where it was estranged from the flat-surface wall (9) which is followed, for example, the point of a crookedness protruding line (12) counters, and (8) is used, and expected effectiveness can be demonstrated.

[0027]

[Effect of the Invention] By above-mentioned order, this invention has the crookedness protruding line to which the tube for heat exchange extends in the die-length direction projected in tubing by being crooked in the shape of a clinch in a part of hoop direction of a tube tube wall. In the heat exchanger by which the edge of this tube was connected to the hollow header at the free passage condition, while changing the insertion arrangement of the tube-like object for airtight soldering of predetermined die length into an adaptation condition at the tube insertion hole of a header It changes the insertion arrangement of the edge of said tube into an adaptation condition into this tube-like object for airtight soldering. And since the junction unification of a header, the tube-like object for airtight soldering and the tube-like object for airtight soldering, and the tube is carried out by soldering A tube, the tube-like object for airtight soldering and the tube-like object for airtight soldering, and a header are joined by the airtight condition, respectively, therefore free passage connection of a tube and the header can be certainly changed into an airtight condition by soldering.

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] The joint structure of the tube and header in one example is shown, drawing (b) is drawing of longitudinal section, and drawing (b) is a cross-sectional view.

[Drawing 2] It is the perspective view shown in the condition of having separated the header of drawing 1, the tube, the tube-like object for airtight soldering, etc.

[Drawing 3] The joint structure of the tube and header in other examples is shown, and drawing (\*\*) is a perspective view shown in the condition that drawing-of-longitudinal-section and drawing (\*\*) separated the cross-sectional view, and drawing (Ha) separated the header, the tube, and the tube-like object for airtight soldering.

[Drawing 4] Furthermore, the joint structure of the tube and header in other examples is shown, and drawing (\*\*) is a perspective view shown in the condition that drawing-of-longitudinal-section and drawing (\*\*) separated the cross-sectional view, and drawing (Ha) separated the header, the tube, and the tube-like object for airtight soldering.

[Drawing 5] Furthermore, the joint structure of the tube and header in other examples is shown, and drawing (\*\*) is a perspective view shown in the condition that drawing-of-longitudinal-section and drawing (\*\*) separated the cross-sectional view, and drawing (Ha) separated the header, the tube, and the tube-like object for airtight soldering.

[Drawing 6] It is the perspective view of a tube.

[Drawing 7] The whole heat exchanger configuration is shown, drawing (b) is a front view and drawing (b) is a top view.

[Drawing 8] It is the perspective view in which showing the conventional example, changing a tube and a header into a separation condition and showing them.

### [Description of Notations]

- 1 — Tube for heat exchange
- 2 — Header
- 12 — Crookedness protruding line
- 15 — Tube insertion hole
- 18 — Tube-like object for airtight soldering

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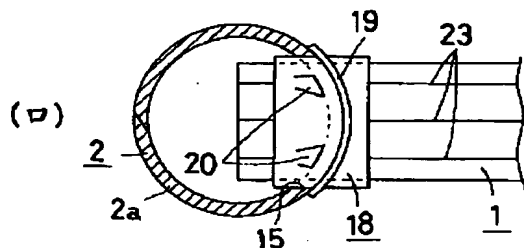
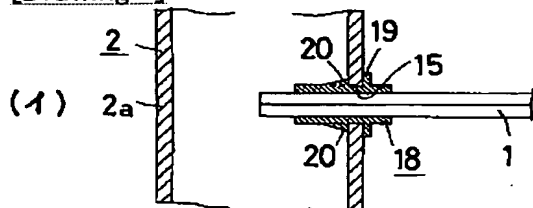
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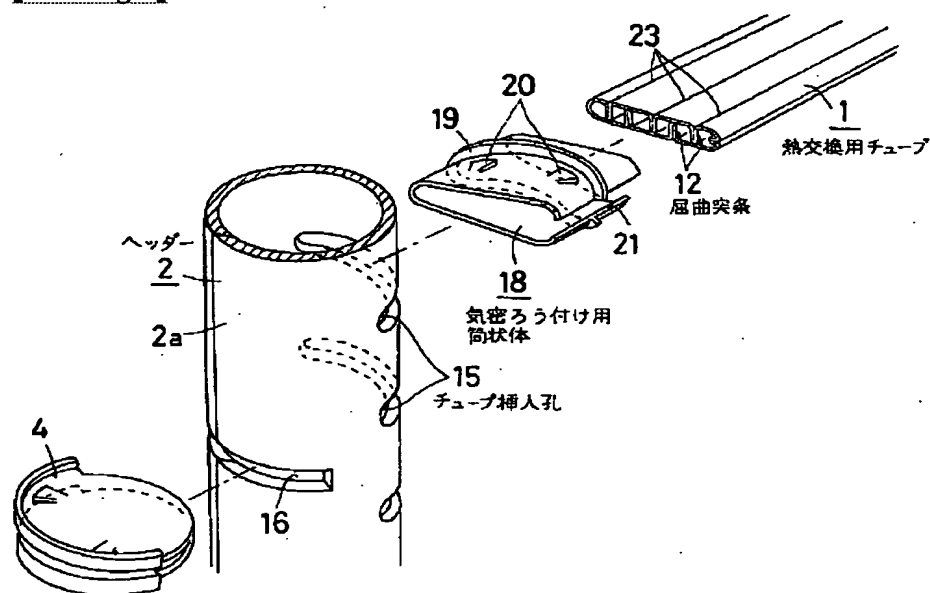
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## DRAWINGS

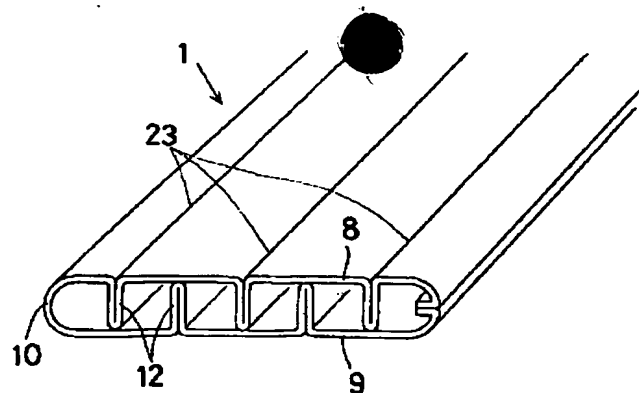
[Drawing 1]



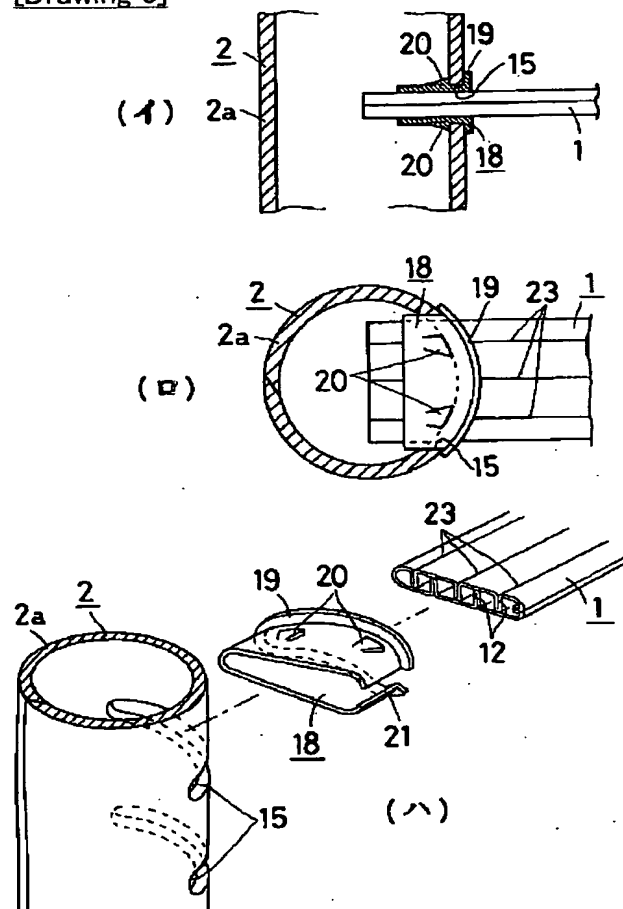
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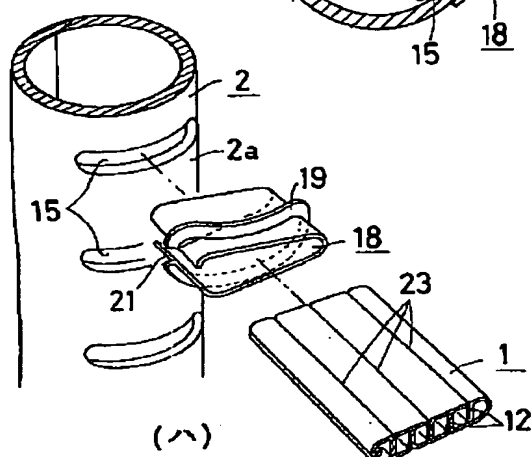
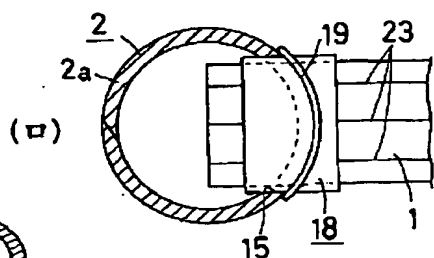
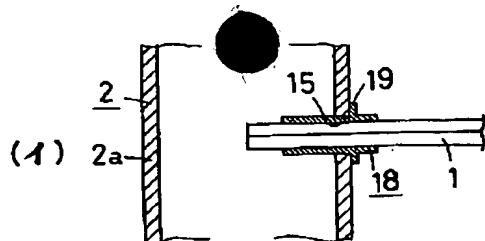
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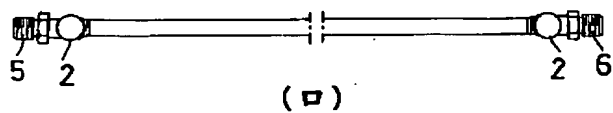
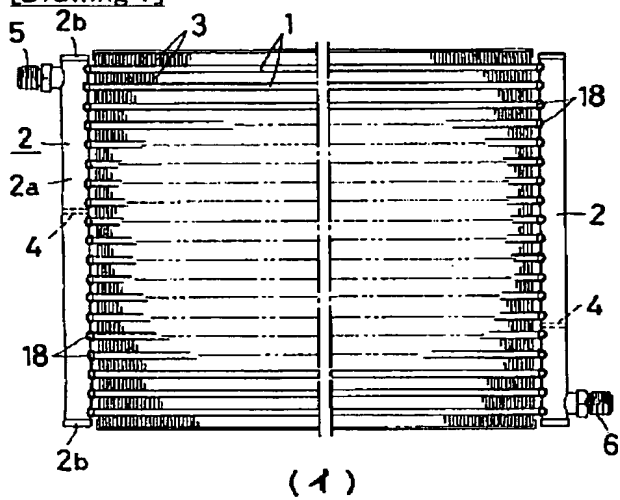
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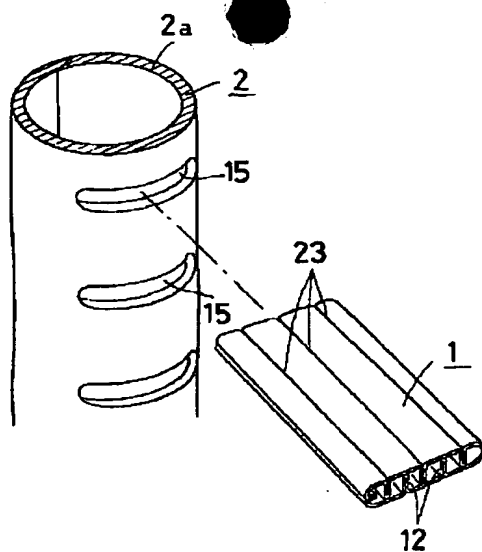
[Drawing 4]



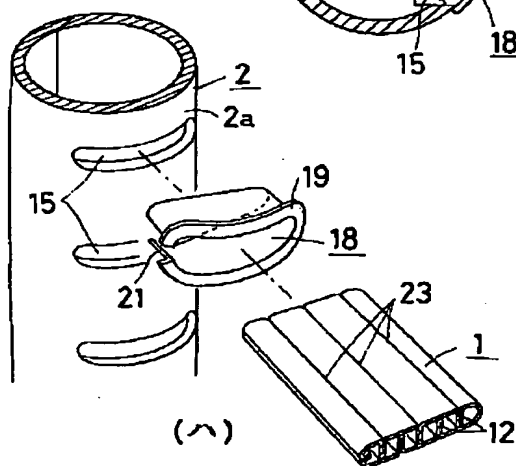
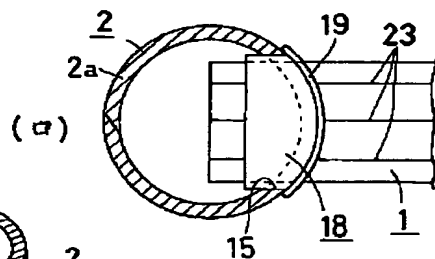
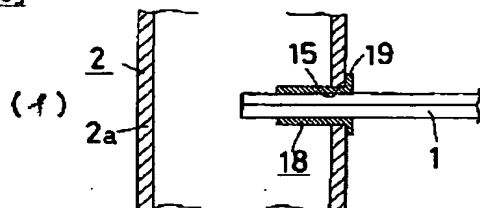
[Drawing 7]



[Drawing 8]



[Drawing 5]



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